Technical white paper

HP ZBook 17 G2 Mobile Workstation

Expand your creative capabilities

On the go creativity knows no limits with a vivid 17.3" diagonal HP ZBook 17 G2. Showcase your best work in the office or on the go and take advantage of HP's most powerful processing, graphics, simple scalability, and blazing-fast connectivity to perform and collaborate at the speed of creativity.

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Chassis and system highlights

HP is proud to introduce its most powerful and expandable mobile workstation—the HP ZBook 17 G2. Designed for workstation-class professionals that demand mobility, the HP ZBook 17 G2 packs incredible performance, innovation and reliability into a mobile form factor.

Innovative sleek design

Proudly display your work on a large, 17.3-inch diagonal screen housed in the durable HP Duracase chassis of the HP ZBook 17 G2. Work in brilliant, trusted color and bring your ideas to life with the optional HP DreamColor[1] display that ensures color consistency across your entire digital workflow. The HP ZBook 17 G2 offers flexible I/O ports, upgradeable bay options, latch-less frame, a backlit keyboard, large touchpad area, and three point buttons.

The streamlined interior is designed with a consistent user access strategy in mind. Get quick access to components with the HP Easy Access Door. Our user-serviceable hard drives are identified with green touch points. We have streamlined our airflow with a strategically vented system to provide a more comfortable and efficient cooling solution.

Professional performance

Take advantage of ISV certified NVIDIA® Quadro® and AMD FirePro™ professional graphics designed to work with the most demanding applications. Run the same professional applications as a desktop workstation without dropping performance. Set a new performance curve with the remarkably fast HP Z Turbo Drive, a PCIe SSD that reduces boot up, calculation, and graphics response times. Thanks to Thunderbolt™ 2[2] technology, you'll transfer data at lightning-fast speeds with the ability to connect to high-resolution displays and high-performance data devices over a single Thunderbolt 2 cable.

Workstation reliability

Optimize your HP ZBook 17 G2 for peak performance with HP Performance Advisor[3] by automatically configuring your system with the most current settings and drivers. Be confident that your ZBook can withstand the demands of professional computing with workstation ISV application certifications, 115,000 hours of testing through the HP Total Test Process, and rigorous MIL-STD-810G standards. And take advantage of HP Sure Start to help ensure a proper boot-up thanks to corruption detection, a self-healing BIOS, and recovery that restarts where it left off if the update stalls, fails, or is corrupted.

Designed with the environment in mind

HP is committed to environmental sustainability and energy efficiency. To reduce energy consumption, HP offers ENERGY STAR® qualified mobile workstation configurations and meets EPEAT® Gold standards.[4] The HP Workstation design team has taken a proactive approach (beyond industry regulations) to recyclability and selecting materials that reduce the impact to the environment.

System architecture

The HP ZBook 17 G2 Mobile Workstation features 4th generation Intel® Core™ i5 and i7 processors[9] and with upgraded ME9 manageability, Intel-integrated USB 3.0 and optional Thunderbolt™ 2[2], it delivers impressive productivity and stability. Other key features include blazingly fast storage via a PCIe M.2 SSD and a wide selection of high-performance NVIDIA® and AMD professional 3D graphics.

New technologies

New Intel® processor micro-architecture

The HP ZBook 17 G2 supports Intel's 4th generation processors, featuring a new micro-architecture and a new instruction set including AVX2 (Advanced Vector Extensions 2.0) and FMA (Floating-point fused Multiply Add instructions) that help deliver faster compute performance, with low energy consumption. Both the latest dual and quad-core Intel® Core™ i5 and i7 processors[5] are supported. The Mobile Intel® Lynx Point PCH (platform controller hub) QM87 chipset complements the HP ZBook 17 G2's core architecture.

Intel Advanced Vector Extensions 2.0 (Intel AVX2)
The new Intel® Advanced Vector Extensions 2.0 (Intel AVX2) extends the Intel® Advanced Vector Extensions (Intel AVX) with 256-bit integer instructions, floating-point fused multiply add (FMA) instructions, and gather operations. The 256-bit integer vectors benefit math, codec, image, and digital signal processing software. FMA can improve performance in face detection, professional imaging, and high-performance computing. Gather operations increase vectorization opportunities for many applications. In addition to the vector extensions, this generation of Intel® processors adds new bit manipulation instructions useful in compression, encryption, and general purpose software.

Intel® Data Protection Technology with AES-NI (Intel AES-NI)
The Intel® Advanced Encryption Standard New Instructions (Intel AES-NI) are a set of Single Instruction Multiple Data (SIMD) instructions that enable fast and secure data encryption and decryption based on the Advanced Encryption Standard (AES). Intel® AES-NI is valuable for a wide range of cryptographic applications, such as applications that perform bulk encryption/decryption, authentication, random number generation, and authenticated encryption. AES is broadly accepted as the standard for both government and industry applications, and is widely deployed in various protocols.

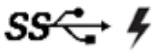
Next generation Intel® Active Management Technology (AMT)
New features for Intel® AMT 9.0 include:

- The Intel® AMT network can now be enabled and disabled.
- Any configuration software can now synchronize the Intel® AMT network time to coordinate with UTC.
- The ability to configure a headless platform remotely without the need for local user-consent has been added.
- Graceful restart support.
  - ME8 only supported hard power operations, which can cause unpredictable system behavior. ME9 adds support for graceful power operations that include Shutdown/Reset/Sleep-deep/Hibernate to improve system stability.

Intel® HD Graphics 4600
The new integrated Intel® HD Graphics 4600 graphics engine provides entry graphics performance. The Intel® integrated HD Graphics 4600 core integrates two graphics cores and 20 Execution Units and offers higher performance than the previous generation Intel® HD Graphics. The Intel® HD Graphics 4600 supports Microsoft® DirectX 11.1, OpenCL 1.2 and OpenGL 4.0. It supports expanded media acceleration features like full hardware decode and encode acceleration as well as advanced video processing features.

1600 MHz memory
The HP ZBook 17 G2 supports standard DDR3 1600 MHz dual channel non-ECC DIMMs. The speed that the memory runs is controlled by the processors, which is 1600 MHz for this generation. Memory configurations from 4 GB to 32 GB are supported.

USB Charging ability
The HP ZBook 17 G2 equips the lower port of the two side USB 3.0 ports with power charging ability. The port is able to provide fast charge (up to 1.5A) to a portable device in the following states: System On, System Sleep, System Hibernate and System Off. It does not support charging in the ErP (Max S5 Power Savings) state. The port supports USB Battery Charging Specification 1.2. The port is marked by the battery charging icon shown here.



Thunderbolt™ 2[2] technology
The HP ZBook 17 G2 provides Thunderbolt 2 technology. The Thunderbolt 2 port uses the Intel® DSL5520 Thunderbolt 2 controller.

The Thunderbolt 2 port provides:

- 20 Gb/s data in each direction
- 12 Watts of power (2 Watts for cable, 10 Watts for bus-powered device)
- Wake from S3 over Thunderbolt 2 (USB, WOL, other wake events)
- DisplayPort 1.2 capability with Multi Stream Transport (MST) support that enables the transport of multiple A/V streams over a single connector
  - Maximum 4096 x 2160 resolution at 60 Hz (8-bit display) or at 30 Hz (10-bit display) to a single display
  - Maximum 3840 x 2160 resolution at 60 Hz (8-bit display) or at 30 Hz (10-bit display) across 4 displays
- Each of the 4 displays can support a 1920 x 1080 resolution
- 4K[4] video file capture and display simultaneously
- Full backward compatibility with Thunderbolt 2 devices

Operating system

Our HP ZBook is compatible with several different operating systems to best fit our users needs. Windows® has been designed to bring you one operating system that can handle all of life's demands—no matter where you are. Whether you're in the office, at home or on the go, Windows is there to deliver. Linux® offers fast, flexible and reliable operating systems for HP Workstations. Designed for organizations requiring security, compatibility, stability and unlimited scalability, Linux® powers millions of computers with enterprise-proven technologies. The HP ZBook 17 G2 supports the operating systems seen below.

Preinstalled
Windows 8.1 Pro 64[10]
Windows 7 Professional 64 (available through downgrade rights from Windows 8.1 Pro)[10]
Windows 8.1 64[10]
Windows 7 Professional 64[10]
Ubuntu Linux[11]
FreeDOS

Supported
Windows 8.1 Enterprise 64[10]
Windows 7 Enterprise 64[10]

I/O and storage

Internal I/O
The HP ZBook 17 G2 provides an MXM 3.1 slot for graphics. This slot has a PCIe Gen3 x16 link to the CPU and provides four DisplayPort connections to the system.

There is one internal M.2 PCIe/SATA slot. This slot is auto-configured at power up to be a PCIe or SATA slot depending on the type of card installed. M.2 slot supports 2260 SSD (Solid State Drive).

The system ships with a WLAN/Bluetooth® card installed in mini-PCIe/mSATA slot 1. The WLAN controller connects via a PCIe bus and the Bluetooth controller connects via a USB 2.0 bus. Both controllers can be enabled or disabled in the BIOS F10 menu by enabling/disabling PCIe slot 1.

This mobile workstation is equipped with a digital microphone array, internal dual-channel 4W speakers and a 2-megapixel webcam.

Storage
The PCI Express M.2 specification was created and provides the needed connectivity to the PCIe bus stimulating both a significant performance bump today and performance growth for the foreseeable future. Through direct connection to the PCIe bus the HP Z Turbo Drive (PCIe M.2 2260 SSD) is able to considerably exceed previous performance capabilities.

The HP ZBook 17 G2 supports a maximum of four drives: 2 x 2.5" 7 or 9.5mm HDD/SSD plus one M.2 2260. The HP ZBook 17 G2 also provides a third 6 Gb/s SATA port for an optical disc drive in the expansion bay. HP offers a slim-line tray-load DVD-R/W drive or a Blu-ray R/W drive.

Intel® Rapid Storage Technology (Intel RST) is supported on the HP ZBook 17 G2. This technology improves the performance of disk intensive retrieval applications and boot times while reducing the power consumption of the chipset and SATA hard drive.

RAID (Redundant Array of Independent Disks)
RAID provides a method of combining multiple disks into a single logical volume to increase performance or create data redundancy. There are various levels of RAID configuration available on the HP ZBook 17 G2 that can be implemented depending on the user's need for performance and redundancy.

Available RAID configurations are:

- *RAID0* – Creates a single volume that has data striped across 2 or more drives. The size of the volume is based on the size of the smallest capacity drive times the number of drives in the RAID0 configuration. RAID0 is typically used to improve performance or create a larger volume from smaller drives. There is no data redundancy protection against a single drive failure.
- *RAID1* – Creates a single volume that is a mirror image of two physical drives. The size of the mirror is limited by the smallest drive used in the RAID1 configuration. This configuration provides data redundancy or parity in a RAID0 configuration.
- *RAID5* – Creates a single volume of striped data across 3 or more drives and distributes parity information across all member disks. This configuration is primarily used where low cost redundancy is desired.

External I/O
On the side I/O area, the HP ZBook 17 G2 has two USB 3.0 ports (one supports battery charging), headset and microphone connections, and an SD 4.0 card reader that supports bus interface speeds UHS-I and UHS-II.

In the rear I/O area are Gbit LAN, DisplayPort, audio Line-In, Line-out, sub-woofer and optical SP/DIF output connections.

Expansion cards
The HP ZBook 17 G2 supports Express Card 54 mm expansion and an integrated SD UHS-II flash media slot that is backward compatible with SDHC, SDXC.

Graphics

Graphics

The HP ZBook 17 G2 supports Hybrid (Switchable) graphics with discrete (MXM Daughter card) NVIDIA® or AMD professional graphics. The NVIDIA®/AMD professional graphics or the Intel® HD Graphics can drive the various DisplayPort routes in the system. The discrete NVIDIA®/AMD graphics option always overrides the Intel® integrated processor graphics.

NVIDIA® professional graphics
The HP ZBook 17 G2 supports discrete NVIDIA® professional graphics via an MXM 3.1 slot with a PCIe Gen3 x16 link. The following NVIDIA® professional 3-D graphics cards are supported:

- NVIDIA® Quadro® K5100M
- NVIDIA® Quadro® K4100M
- NVIDIA® Quadro® K1100M
- NVIDIA® Quadro® K3100M

NVIDIA® professional graphics cards drive up to four independent and simultaneous displays and support Clone, Extended or Mosaic modes for the displays. The HP ZBook 17 G2 routes the four outputs of the NVIDIA® card as follows:

- DisplayPort 1.1a to the internal display at 3200 x 1800 @ 60 Hz maximum resolution (1920 x 1080 on 17 G2)
- DisplayPort 1.1a to the external DisplayPort connector on the side I/O at 2560 x 1600 @ 60 Hz maximum resolution
- DisplayPort 1.2 to the optional Thunderbolt™ 2[2] module port 1 at 4096 x 2160 maximum resolution to a single display

AMD professional graphics
The HP ZBook 17 G2 supports discrete AMD professional graphics via an MXM 3.1 slot with a PCIe Gen3 x16 link. The AMD FirePro™ M6100 professional 3-D graphics card is supported.

Intel® HD Graphics
Intel® fully supports Intel HD Graphics 4600 with the QM87 chipset. Intel® Quick Sync is supported on all Intel® processor SKUs with Intel HD Graphics. This feature provides faster video transcoding.

Intel® HD Graphics supports three independent and simultaneous displays and supports Clone, Extended and Collage modes for the displays. In the case of three simultaneous displays, two High Definition Audio streams over the digital display interfaces are supported. The HP ZBook 17 G2 routes the three ports from the Intel® HD Graphics as follows:

- DisplayPort 1.1a to the internal display at 3200 x 1800 @ 60 Hz maximum resolution
- DisplayPort 1.1a to the external DisplayPort connector on the side I/O at 2560 x 1600 @ 60 Hz maximum resolution
- DisplayPort 1.2 to the optional Thunderbolt 2 module at 4096 x 2160 at 24 Hz or 3840 x 2160 at 60 Hz maximum resolution to a single display

Networking and security

Wireless networking

The HP ZBook 17 G2 supports WLAN (Wi-Fi 80.11 a/b/g/n) and Bluetooth® (BT 4.0) via M.2 Minicard (Intel® 7206 AC 2 x 2 a/b/g/n/AC + BT 4.0). WWAN (LTE/3G) is also supported (option) via M.2 module. More information on wireless networking can be found in the “Resources, contacts, or additional links” section at the end of this document.

Security

The HP ZBook 17 G2 supports Integrated Smart Card Reader, Fingerprint reader and TPM 1.2 security processor. Pre-boot authentication, TPM and enhanced drive lock are supported.

Display options

As a mobile workstation customer, we know that viewing your work precisely is critical to your success. You need the right display in order to accurately and efficiently get your work done. Our HP ZBook 17 G2 offers different display options to ensure you will get the best visual experience. This section will help you choose the display that is right for you. Our mobile workstation can also be docked to take advantage of our HP Z Displays.

Display technology background and information

There are many different measures used to understand or express the performance of a mobile workstation-level display. Although display resolution, the most obvious measure, is important for clarity, there are other measures of a display that contribute to your viewing experience such as screen brightness, viewing angle, response rate, and bit-precision.

IPS displays

Our displays contain In-Plane Switching (IPS) technology. While Twisted Nematic (TN) displays are common in the industry, IPS displays offer superior viewing angles, color accuracy and newer technology to create an immersive viewing experience.

Viewing angles

The viewing angle of a display represents how far left, right, down or up a display can be observed at with acceptable viewing performance. When looking at a TN screen from an angle, the images on the display often look faded or disappear completely. This is due to the TN displays' shallow viewing angle. Figure 1 below shows the effect different viewing angles have on a TN display. Alternatively, an IPS display has a larger viewing angle of up to 178 degrees that allows the screen to be viewed comfortably from several positions. Wider viewing angles are especially useful when several users are viewing one screen, or the screen is not being viewed head-on.

Viewing angles for mobile workstations are usually measured in a left/right/down/up format. This means they have an angle measurement for each viewing direction. A standard viewing angle (SVA) is 40/40/15/30. This means you can view it 40 degrees to the left, 40 degrees to the right, 15 degrees down, and 30 degrees up while still having adequate color and detail. The next step up, wide viewing angle (WVA), measures in at 60/60/50/50. The ultra-wide viewing angle (UWVA), which is also available on our HP ZBook 17 displays, measures at 85/85/85/85.

Figure 1. The effect different viewing angles have on IPS and TN displays

Brightness

Luminance and brightness, while being different terms and measurements, represent the same thing. While brightness is a relative measure, luminance is an exact measurement of light output from your display. Luminance is measured in candelas per square meter (cd/m^2) often referred to as cdm or, in the shorthand, nits. Simply put, a cdm measures the amount of light a screen produces relative to screen size, facilitating an easy comparison between differing screen sizes. Another benefit of measuring screen brightness in nits is how straightforward the scale is to understand: the more cdm, the brighter the screen.

While luminance is an important value to keep in mind, brighter doesn't always mean better. High luminance monitors work great in bright environments but may not be suitable for lower light conditions as they may cause eye strain or headaches. Be sure to assess your work location before selecting how bright your monitor will be.

Refresh rates

The refresh rate of a display measures the amount of times the display is updated every second. A higher refresh rate means decreased blurring and ghosting effects when using the display. Ghosting is the effect when an image or video moves on your display and leaves a faint trail. Having a good refresh rate, commonly around 60 Hz (60 images/second), assures video playback and display use is smooth.

Bit depth

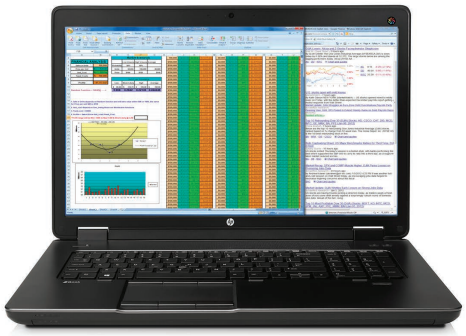
Bit depth refers to the amount of colors a display can produce. The most common display bit depths are eight- and ten-bits per RGB channel. For example, an eight-bit per RGB display can show 256 shades of red, 256 shades of green, and 256 shades of blue per pixel while a 10-bit per RGB display can produce 1024 shades of red, green, and blue per pixel. The difference in bit-depths is most noticeable during color-intensive applications such as photo editing, animation, and designing. Ten-bit displays produce more than one billion colors, essentially eliminating banding artifacts and contouring.

Resolution

Screen resolution measures the amount of pixels a screen can display. Usually measured in the format "Width x Height", a display of 1920 x 1080 would contain 1920 pixels horizontally and 1080 pixels vertically for a total resolution of 2,073,600 pixels. A higher screen resolution means more pixels and more detail in the images on your display. Figures 2 and 3 illustrate the difference between a lower resolution display and a higher resolution display. A display with more pixels allows you to view more information on one screen due to increased pixel density. In theory, a display with more pixels should allow you to view more on your screen at once than a display with a lower pixel count.

Figure 2. 720p display on an HP ZBook 17

Figure 3. 1080p display on an HP ZBook 17



Similar to resolution, displays can be measured in pixels per inch (PPI). This simple measurement takes both screen size and resolution into account to define the amount of pixels per square inch present in the display. A display with a low PPI measurement has fewer pixels per inch and lower quality image production than a display with a high PPI measurement. Generally, image sensitive work requires a high PPI display.

Resolution types

Displays exist in several resolutions. Table 1, shown below, outlines the resolution differences of displays offered in the market.

Table 1. High definition video standards

Video standard	Full name	Resolution
HD	High Definition	1280 x 720
HD+	High Definition Plus	1600 x 900
FHD	Full High Definition	1920 x 1080
QHD	Quad High Definition	2560 x 1440
QHD+	Quad High Definition Plus	3200 x 1800
UHD/4K	Ultra High Definition	3840 x 2160
Cinema 4K	Cinema High Definition	4096 x 2160
Q2HD/5K		5760 x 2880

Anti-Glare

Anti-Glare finish reduces the amount of light the display reflects allowing use in bright or outdoor environments with reduced eye strain. A matte finish anti-glare is the most common and works by using a rough, matte surface to scatter light rather than reflect it. Chemical anti-glare uses a chemical coating over a smooth surface to cut down on the reflection of light. Matte finishes reduce glare more effectively than chemical finishes, but chemical finishes do not degrade viewing quality as noticeably as matte does.

HP display solutions

HP ZBook 17 G2 displays

Our HP ZBook 17 G2 is crafted to maximize your productivity. The 17-inch diagonal screen size with a 16:9 aspect ratio provides a comfortable workspace and keyboard layout. With multiple resolution, viewing angle, and brightness options you can choose the perfect display for your needs.

Table 2. HP ZBook 17 G2 display options

	Resolution	Refresh rate*	Brightness*	Viewing angle
17.3" diagonal LED-backlit HD+	1600 x 900	60 Hz	200 nits	SVA
17.3" diagonal LED-backlit FHD	1920 x 1080	60 Hz	300 nits	WVA
17.3" diagonal LED-backlit FHD DreamColor	1920 x 1080	60 Hz	300 nits	UWVA

* All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

When selecting a display, be sure to consider what the display will be used for. If visual details are important, a higher resolution display is a must. However, if you mainly use your computer for word processing and Excel, a lower resolution display is a cost-efficient option.

HP Z Displays

We offer our HP Z displays for those times you need something bigger. Switching from an HP ZBook display to an HP Z Display is as simple as "click and go" when combined with a docking station. With sizes ranging from 22" to 30" diagonal displays you can find the perfect size for your work. HP Z Displays offer the same great resolution, brightness, viewing angles, and quality of the HP ZBook display on a much larger screen and even with multiple monitors at once enabling you to be as productive as possible.

HP DreamColor

HP offers high-quality displays with our HP DreamColor technology in both our HP ZBook 17 G2 and HP DreamColor Displays. These displays offer brilliant ten-bit color that drive 1.07 billion colors onscreen. Factory calibrated for high color accuracy and recalibrate-able with the DreamColor Calibration Solution or other professional measurement instruments (Z27x only), HP DreamColor allows users to excel in areas including animation, visual effects, post production, digital photography, and digital pre-press. With 4K[6] input support (Z27x only), HP DreamColor Displays offer high definition with beautiful color as well as accurate brightness adjustment using candelas per square meter instead of relative brightness measurements. Both the DreamColor option on the HP ZBook 17 and the stand-alone HP DreamColor Displays carry the same specs and quality to keep your work perfect. Color is consistent across every DreamColor display—one of the many amazing reasons HP DreamColor is outstanding.

Table 3. HP Z Displays and HP DreamColor Displays

	Resolution	Brightness (max)
HP Z22i	1920 x 1080	250 nits
HP Z23i	1920 x 1080	250 nits
HP Z24i	1920 x 1080	300 nits
HP Z27i	2560 x 1440	350 nits
HP Z30i	2560 x 1440	350 nits
HP DreamColor Z24x	1920 x 1200	350 nits, calibrated
HP DreamColor Z27x	2560 x 1440	300 nits, calibrated

Recap

With different resolutions, response rates, viewing angles, bit precision, and display types, the choice of display can be overwhelming. However, understanding what these measurements mean and why they are important is helpful when choosing a display. Our HP ZBook 17 G2 display options, HP DreamColor Displays, and HP Z Displays are perfect for any workstation-worthy job and can benefit professionals in any field.

Multiple display support

The HP ZBook 17 G2 Mobile Workstation supports a maximum of six independent displays by utilizing display outputs from both the Integrated Intel® GPU (Graphics Processing Unit) and the Discrete GPU.

The number of independent displays supported depends on a number of factors, including if a docking station is used, if a DisplayPort Hub or "daisy-chain" capable display is being used, and whether Hybrid Graphics is enabled.

Due to more stringent color requirements, Dreamcolor panels only use display outputs from the Discrete GPU, and thus the maximum number of independent displays supported is reduced from six to four on SKUs with NVIDIA® graphics and five on SKUs with AMD graphics.

HP ZBook 17 G2 without a docking station

The HP ZBook 17 G2, without the use of a docking station, supports a maximum of four independent displays on SKUs with NVIDIA® graphics and five on SKUs with AMD graphics. These four displays include the internal panel plus three external displays connected to the VGA, the DisplayPort (DP), and the Thunderbolt™ 2[2] port connectors. On SKUs with AMD graphics, an additional external display is supported for a maximum of five independent displays through the use of DP 1.2 "daisy-chain" feature (see below).

Table 4. Displays supported without a docking station

	Hybrid Graphics enabled		Hybrid Graphics disabled	
Displays supported without a docking station	Up to 4 of these displays may be active:	Internal Panel DisplayPort*[7] Thunderbolt™ 2[2] VGA	Up to 4 of these displays may be active:	Internal Panel DisplayPort*[7] Thunderbolt™ 2[2] VGA

* The VGA and DisplayPort connector on the HP ZBook 17 G2 are disabled when using the docking station.

Docking stations

The HP Standard Docking Station has three display output connectors: VGA, DVI and DP. The HP Advanced Docking Station has five display output connectors: a VGA and four digital display connectors (two DVI and two DP). Of the four digital display connectors only two may be used at a time (two DVI, two DP, or one DP and one DVI). When used together with the HP ZBook 15 G2, a maximum of five independent displays are supported. These five displays are the internal panel plus four external displays connected to three display outputs connectors on either the standard or advanced docking station, and the Thunderbolt connector on the HP ZBook.

Table 5. Displays supported with a docking station

	Hybrid Graphics enabled		Hybrid Graphics disabled	
Displays supported with HP Standard Docking Station	Up to 5 of these displays may be active:	Internal Panel Thunderbolt™ 2[2] Dock's VGA Dock's DisplayPort*[7] Dock's DVI	Up to 4 of these displays may be active[8]:	Internal Panel Thunderbolt™ 2[2] Dock's VGA Dock's DisplayPort*[7] Dock's DVI
Displays supported with HP Advanced Docking Station	Up to 5 of these displays may be active:	Internal Panel Thunderbolt™ 2[2] Dock's VGA Dock's DisplayPort*[7]/DVI Dock's DisplayPort*[7]/DVI	Up to 4 of these displays may be active[8]:	Internal Panel Thunderbolt™ 2[2] Dock's VGA Dock's DisplayPort*[7]/DVI Dock's DisplayPort*[7]/DVI

* The VGA and DisplayPort connector on the HP ZBook 17 G2 are disabled when using the docking station.

DisplayPort 1.2 "daisy-chain" feature

DisplayPort (DP) v1.2 supports "Multi-Stream Transport", which allows multiple video streams across a single DisplayPort connection. This is commonly referred to as DP 1.2 "daisy-chain" feature where multiple displays may be driven by a single DisplayPort connector.

The HP ZBook 17 G2, HP Standard Docking Station, and HP Advanced Docking Station support the DisplayPort v1.2 "daisy-chain" feature. With the use of a DisplayPort 1.2 Hub or a DisplayPort 1.2 Display that supports Multi-Stream Transport or "daisy-chaining", a user may connect multiple external displays to a single DP connector on either the HP ZBook or a supporting docking station. This capability provides flexibility on the type of displays that may be used. For example, three DP displays may be connected with the use of a DP 1.2 Hub with all three DP monitors connected to the Hub, and the Hub connected to the DP connector on the HP ZBook 17 G2.

The "daisy chain" feature increases the HP ZBook 17 G2's maximum display number to six. This requires Hybrid Graphics to be enabled, one monitor connected to VGA, and at least one daisy-chain connection on (A) System DP, (B) Docking Station DP 1, (C) Docking Station DP 2.

Table 6. Displays supported with DP 1.2 Hub and/or DP 1.2 MST Monitor

	Hybrid Graphics enabled	**Hybrid Graphics disabled**
Displays supported without a docking station and DP 1.2 Hub	Up to 6 displays may be active. A maximum of 2 of these are from group A and 4 from group B. Group A: Internal Panel VGA Group B: Thunderbolt™ 2[2] Displays connected to DP1.2 Hub*[9]	Up to any 4 combination of these displays may be active*[8]: Internal Panel Thunderbolt™ 2[2] VGA Displays connected to DP1.2 Hub*[9]
Displays supported with a docking station and DP 1.2 Hub	Up to 6 displays may be active. A maximum of 2 of these are from group A and 4 from group B. Group A: Internal Panel Dock's VGA Group B: Thunderbolt™ 2[2] Dock's DVI Displays connected to DP1.2 Hub(s)*[9]	Up to any 4 combination of these displays may be active*[8]: Internal Panel Thunderbolt™ 2[2] Dock's VGA Dock's DVI Displays connected to DP1.2 Hub(s)*[9]

*Multiple displays may be connected to DP 1.2 hub. DP 1.2 hub is connected to a DisplayPort connector on the ZBook or docking station.

Hybrid Graphics

By leveraging display outputs from both the integrated Intel® GPU and the discrete GPU, the HP ZBook 17 G2 is able to support a large number of independent displays when Hybrid Graphics is enabled.

Hybrid Graphics is always enabled by default on the HP ZBook 17 G2. When Hybrid Graphics is disabled (may be disabled through BIOS Setup), the display outputs from the integrated Intel® GPU are not available for use. As a result of this, the maximum number of independent displays supported is reduced to four on these models with NVIDIA® graphics. With AMD graphics, the maximum number of independent displays is five when Hybrid Graphics is disabled—however, two of the external displays must be of DisplayPort type.

Special note on Hybrid Graphics during Pre-OS environment

With Hybrid Graphics, HP is using displays that may be connected to either one or both GPUs. Because the standard industry support for Pre-OS session involves only one GPU, there is a standard industry limitation where only displays connected to the integrated GPU may be used during Pre-OS. As such, display(s) attached to the discrete GPU are not viewable during Pre-OS. For example, if users boot with the panel closed and an external display attached to a DisplayPort connector driven by the discrete GPU, that display cannot show any image during Pre-OS session such as during POST, when in BIOS setup, when running early diagnosis, when using Power-On Password, and so on.

HP has implemented special support to resolve this limitation. With Hybrid Graphics, any display, whether it is connected to the integrated or discrete GPU, is usable (viewable) during Pre-OS. This feature is called "Hybrid Graphics Enhanced Display" and is by default enabled in BIOS*. Users may disable this feature to only support Pre-OS session with integrated GPU displays (which is typically limited to the internal Panel and VGA).

* HP ZBook 17 G2 setups with the Dreamcolor panel configuration do not have the ability to enable/disable Hybrid Graphics in BIOS.

Multiple displays management

Users may use NVIDIA® Control Panel to manage multiple displays. A quick way to enable all displays connected (up to the maximum supported) in extended desktop mode is to use Windows® presentation key and choose "Extend" mode. 1) Connect displays; 2) Press Windows logo key + P; 3) Select Extend.

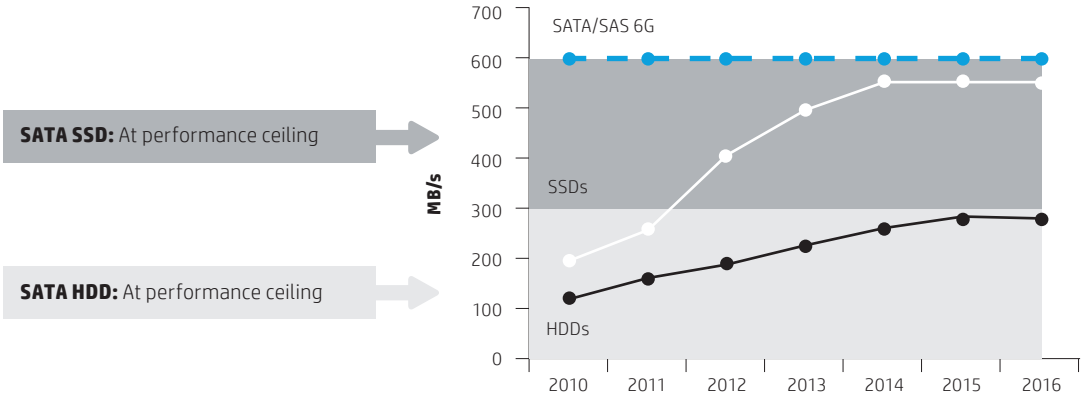
SATA to PCIe technology transition for SSDs

This section highlights the transition from SATA protocol to PCIe protocol as it relates to solid state storage devices.

Why the transition from SATA to PCIe?

A new interface and form factor (M.2) enables this transition of SSD devices onto the PCIe bus. The M.2 form factor provides support for various devices, focusing on SSDs that support either the legacy SATA interface or the quickly developing PCI Express interface. This transition fosters performance improvements of SSDs on the HP ZBook 17 G2. The HP Z Turbo Drive, built on the industry standard M.2 form factor, is a PCIe based SSD storage device that takes advantage of this opportunity. Our HP ZBook solid state drives have transitioned from mSATA SSDs on the HP ZBook 17 G1 to M.2 SSDs on the HP ZBook 17 G2, also known as HP Z Turbo Drive.

Today's SATA HDDs and SATA SSDs have reached a performance ceiling. HDDs are limited by the mechanical nature of the devices, while SATA SSDs are limited by the 6 Gb/s (600 MB/s) ceiling of the SATA bus. HP's SATA I/O working group has strategically shifted focus from the SATA bus to the multi-lane capabilities of PCI Express.



In order to support multi-lane PCIe devices, a new specification was needed to enable performance improvements of storage in small devices. The PCI Express M.2 specification was created and provides the needed connectivity to the PCIe bus providing both a significant performance bump today and performance growth for the foreseeable future.

Introduction to M.2 interface and form factor

M.2 is a specification for internally mounted computer expansion cards and associated connectors. Through different keying the M.2 specification supports multiple functions for add-in cards including WLAN (Wi-Fi), 3G/LTE (WWAN), and solid-state drives (SSDs). Exposed buses through M.2 are SATA, PCI Express 3.0, SATA 3.0, and USB 3.0 buses. M.2 storage devices replace mSATA with a denser, more flexible physical specification that is most suitable for SSDs, especially when utilized in small devices.

M.2 PCIe SSD

mSATA SSD

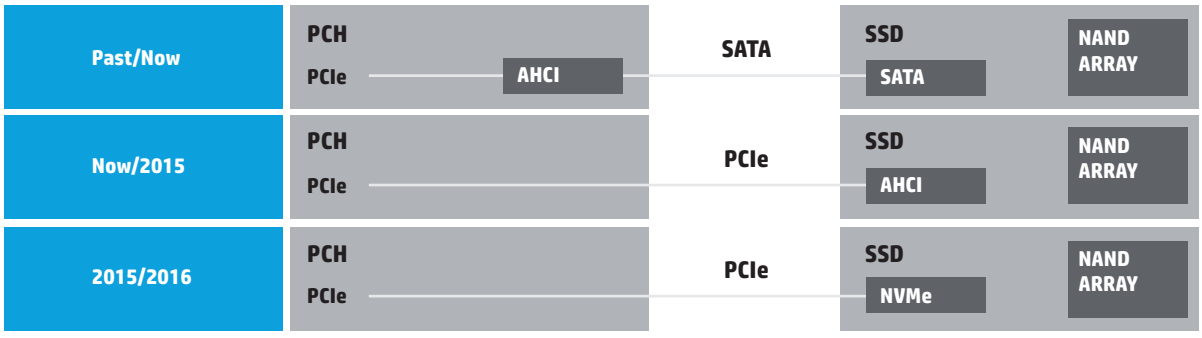
M.2 benefits and features

- Maximizes usage of card space

Table 9. Physical dimension specification comparison between mSATA and M.2

	mSATA	M.2
Board Area (mm)	30 x 50.95	22 x 30, 22 x 42, 22 x 60, 22 x 80, 22 x 110

  - Longer modules and double-sided components population allows double the storage capacity within the footprint of mSATA SSD devices
- Four PCI Express lanes and one SATA 3.0 6 Gb/s port accessed through same connector
  - Compatibility to legacy storage interface (SATA)
  - Same form-factor and interface provides path to the PCIe storage devices of the future
- Reduces bottlenecks by connecting directly to the PCIe bus thus providing an excellent solution for those with large files and big data workflows
  - Bandwidth to the SSDs increases due to lane aggregation
  - Simpler storage hierarchy reduces latency
- Three storage interface options – M.2 provides a path from today's technology to tomorrow's
  - AHCI: Enables smooth transition to PCIe SSD storage devices. By utilizing existing drivers, users can easily transition to the new interface and enjoy the advantages
  - NVMe: Future implementation designed specifically for non-volatile memory, the new NVMe controller:
    - Lowers latency
    - Lowers command overhead
    - Exploits the parallelism available in modern host HW and SW



Performance advantage with HP Z Turbo Drive

As previously mentioned, current mSATA SSDs connected via a SATA connection are performance limited by the 6 Gb/s ceiling of the SATA bus. With the implementation of the M.2 specification and use of PCIe SSD devices, performance levels now exceed 6 Gb/s.

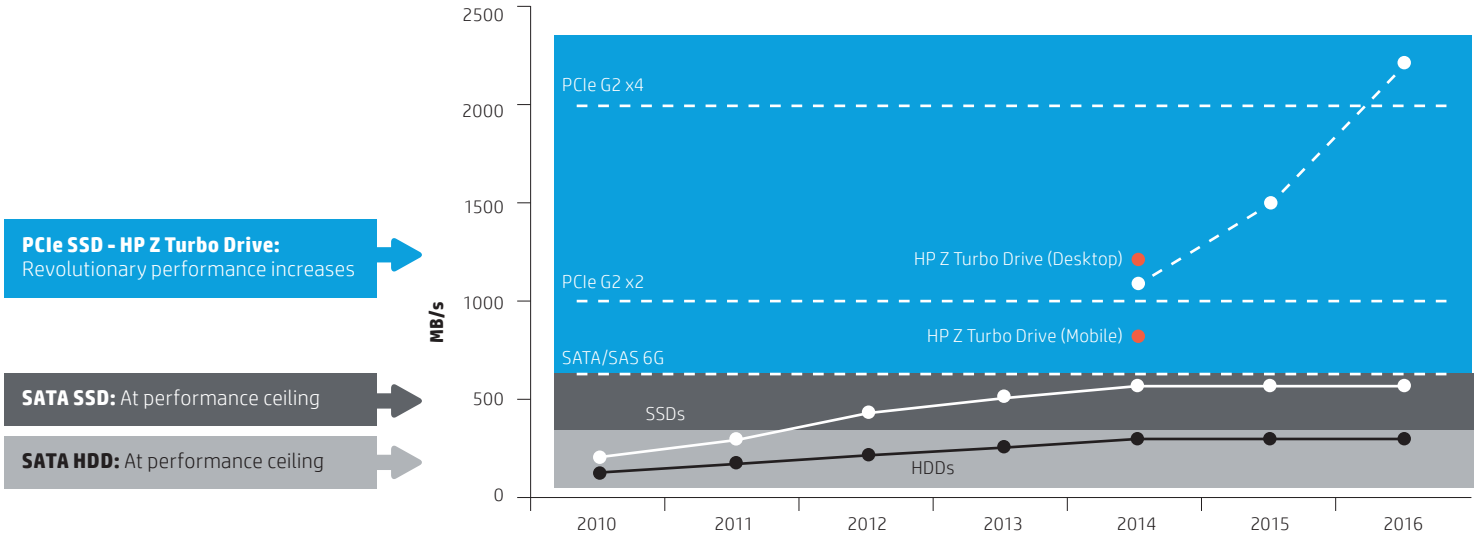
The HP ZBook 17 G2 takes advantage of this opportunity with the introduction of HP Z Turbo Drive. The HP Z Turbo Drive is a PCIe SSD storage device built on the industry standard M.2 form factor connected to the PCIe bus via the M.2 interface. In an HP ZBook 17 G2 the HP Z Turbo Drive connects to two lanes of PCIe G2 while the HP Z Desktop Workstations utilize four lanes.

Table 10. HP Z Turbo Drive specifications on HP Z Desktop Workstations and HP ZBook Mobile Workstations

HP Z Turbo Drive	HP Z Desktop Workstations	HP ZBook Mobile Workstations
Connection	4 PCIe G2 lanes*	2 PCIe G2 lanes
Performance	>1000 MB/s (read)	>600 MB/s (read)
Sequential read	1080 MB/s	675 MB/s
Sequential write	800 MB/s	550 MB/s

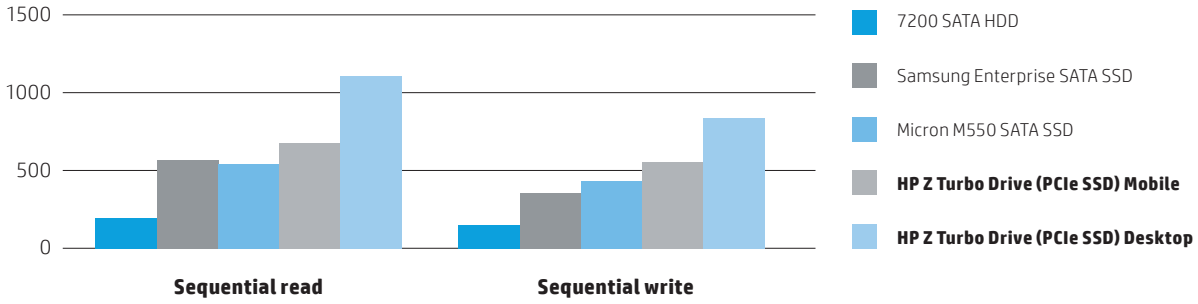
*Dependent on PCIe slot used and the capabilities of the M.2 module

The chart below shows a comparison of storage device performance measured in MB/s. By directly connecting to the PCIe Bus, the HP Z Turbo Drive is able to considerably exceed previous performance capabilities.



Detailed performance and benchmarking results

Figure 4.Sequential R/W performance (MB/s)



Customer advantages

The HP Z Turbo Drive benefits all workstation customer segments by allowing customers to realize performance gains due to improvements in storage performance. While workflows with large date files will see the most noticeable improvement, all users will appreciate the improved transfer rates and quicker performance.

These specific segments are:

- Product Development/Architecture Engineering and Construction
- Media & Entertainment
- Finance
- Oil & Gas
- Geospatial

Summary

The transition from SATA to PCIe protocols for Solid State Devices enables customers to utilize the M.2 form factor to benefit from faster data transfer speeds and improved storage performance. The HP Z Turbo Drive offering on the HP ZBook 17 G2 provides a huge performance gain over HDDs, enables large file/big data workflows, and offers impressive price/performance for NAND components. Integrating the HP Z Turbo Drive technology into HP platforms increases the flexibility

of the storage subsystems and provides the user options for performance and capacity that stand out in the industry.

Power supply

Save size and weight

The HP ZBook 17 G2 Mobile Workstation takes the reliability and performance advantages of a workstation on the go. With Intel® processor technology, NVIDIA® mobile graphics cards, and Thunderbolt™ 2[2] connectivity, professionals can take their work with them wherever they travel. Our powerful system requires an efficient power supply that can be cumbersome, but the flexibility in configuring an HP ZBook 17 G2 Mobile Workstation allows the user to select a smaller, lighter power brick.

Function of the power supply
External power supplies convert the 120V or 240V AC power, depending on the country, from a wall outlet into DC current. The ZBook 17 will only pull as much power as required to operate all operating components and open applications. Power supply units have an efficiency rating, measured as a percentage of power the machine uses out of total power pulled from the source.

The HP ZBook 17 G2 ships with two power supply options to best meet the demands of a fully loaded machine running an intense workload. Multitasking users that work with multiple displays and heavy workloads will require a larger power supply. Many users, however, use their mobile workstation for work flows with fewer power demands. With a lower watt power option, users are able to save themselves the size and weight of a larger power supply while taking their mobile workstation wherever their passion leads them.

What happens if the power supply is too low in wattage?
The HP ZBook 17 G2 can be configured in the settings to run in full use, balanced, or power saving modes. When the ZBook is connected to a landline, it will attempt to pull all of the current it needs from the wall. If the energy demand exceeds the power supply rating, the management system within the BIOS will automatically draw the additional power needed from the battery. In this case, it is possible to drain the battery while connected to a landline. Users should consider an upgraded power option to avoid this scenario as frequent battery drain can degrade the overall battery life. When ran at maximum capacity, low watt power supplies may produce noticeable but not harmful heat.

The HP ZBook 17 G2 is compatible with the following AC power adapters that are offered as an after market option:

- 150 W
- 200 W
- 230 W

What makes the power adapter smart?
The Smart Feature displays a pop-up message:

“For full performance, connect a higher capacity AC adapter”

This message informs the user that as power demands increase, the ZBook may not perform at full capacity, which may result in longer battery charging time. In cases of extreme power demands, the system may also throttle back the processor or with systems that have discrete video subsystems, a video balance mode may occur to further balance the power needs of the system.

NOTE: System CPU functions always have priority over battery charging, so charging delays will occur first.

Table 7. HP ZBook 17 G2 AC power adapter configure to order options

Adapter	External HP 200 W Slim Smart AC adapter	External HP 230 W Slim Smart AC adapter
Size	172 x 96 x 25.4 mm	200 x 100 x 25.4 mm
Weight	748 g	840 g
Total cord length	12 feet (3.66 meters)	12 feet (3.66 meters)

Switch it up
When workloads change or the user finds that they require a different power supply, all of the power supply sizes are offered as after market options that customers can purchase at a later time. In the case of a professional using a docking station to connect at work, it is highly recommended to use the higher wattage power supply option. For many of these users, the purpose of a docking station is to connect to a larger and/or multiple displays, often to use more applications that require greater resources. For this reason, it is best to choose the higher wattage power supply. HP recommends the External HP 230 W Slim Smart AC adapter for optimal performance on the HP ZBook 17 G2.

MIL-STD-810G Testing

The HP ZBook 17 G2 Mobile Workstation is designed with reliability in mind, which is why it undergoes a series of tests. This testing consists of a variety of conditions that are intended to evaluate the reliability of the HP ZBook 17 G2 under a specific set of environmental conditions.

HP Total Test Process

The HP ZBook 17 G2 is intended to provide our users with a reliable product wherever they go, under many conditions. In the design phase, we start with the HP Total Test Process. This is a multi-tiered product validation process with comprehensive, end-to-end diagnostics and a minimum of 100,000 hours of testing per platform. After this phase, we send our products to a third party to see how well they can match up against the MIL-STD-810G testing process.

MIL-STD-810G testing

MIL-STD-810G testing is from the Department of Defense (DoD) Test Method Standard for Environmental Engineering Considerations and Laboratory Tests. This standard, though created specifically for DoD, is widely used for a variety of technological devices, including the HP ZBook 17 G2. It outlines a broad range of tests that can be tailored to measure the reliability of specific pieces of equipment and is intended to help organizations design their equipment to survive in the field. The MIL-STD-810G is a set of testing standards set by the U.S. military and it is now the most widely used international standard for testing a computer's durability. It uses a range of test methods to determine the reliability of the equipment. The series of tests performed are approved and used by all departments and agencies of the DoD. This set of standards are used to:

- Define the environmental stresses, durations, and equipment lifecycle
- Develop analysis and test criteria tailored to the equipment and its environmental life cycle
- Evaluate equipment lifecycles when exposed to environmental stresses
- Identify deficiencies and defects in the design, materials, manufacturing processes, packaging techniques, and maintenance methods
- Demonstrates compliance with contractual requirements

How does the HP ZBook 17 G2 measure up?

Below is the ZBook 17 G2 MIL-STD testing report. The ZBook 17 G2 passed all 13 test and all tests were performed from a 3rd party to ensure accurate testing results and no bias in the reports.

Table 8. MIL-STD-810G tests passed by the HP ZBook 17 G2 in 2014

	MIL-STD-810G reference
Drop	Method 516.6 Procedure IV
Functional shock	Method 516.6 Procedure I
Vibration	Method 514.6 Procedure I category 4 Method 514.6 Procedure I category 24
Dust	Method 510.5 Procedure I
Humidity	Method 507.5 Procedure II
Altitude	Method 500.5 Procedure I Method 500.5 Procedure II
High temperature	Method 501.5 Procedure I Method 501.5 Procedure II
Low temperature	Method 502.5 Procedure I Method 502.5 Procedure II
Temperature shock	Method 503.5 Procedure I

Testing scenarios

A third party performs the various MIL-STD testing at their own facility. This eliminates any bias in the testing and ensures that the durability of our products is accurately measured for customers. The variety of tests that the HP ZBook 17 G2 undergo are listed below with explanations to the specific testing purpose.

Drop test

The drop test is performed in accordance to the MIL-STD-810G, Method 516.6 Procedure IV. The purpose of this test is to determine if the notebooks can operate safely after dropping the unit 30 inches, 26 times on each side and each edge onto 2" of plywood over steel over concrete.

Test philosophy

Test 1: Planar Drop Test

A typical or normal drop of an entire, functional, fully configured system (on six planes) to a linoleum* over concrete floor is performed at a drop height of 36". The six planes of testing are:

- Bottom face
- Top face
- Front face
- Back face
- Right face
- Left face

*Remark: PVC tiles over steel floor

Test 2: Corner Drop Test (Continue to run Corner drop on the same sample if it passed Test 1 planar drop)

A typical or normal drop of an entire, functional, fully configured system (on four corners) to a linoleum over concrete floor is performed at a drop height of 36". The four planes of testing are:

- Top left
- Top right
- Bottom left
- Bottom right

Shock test

There are two types of shock tests performed in accordance to the MIL-STD-810G. The first is the Functional Shock Method 516.6 Procedure I and the second is the Temperature Shock Method 503.5 Procedure I.

The purpose of the functional shock test is to determine if the ZBook can operate after sudden exposure to physical shock. During this test, three shocks are performed across each axis and direction for a total of 18 shocks. Shock testing of products and materials determines to what degree the items can physically and functionally withstand a relatively infrequent, short time, moderately high-level force impulse that would be encountered in handling, transportation, and service environments. This test is done with the same machine as Vibration.

The purpose of the temperature shock test is to determine if the ZBook can operate after sudden exposure to changes in ambient tempurature. During this test, the high temperature is set to be 96ºC (205ºF) and the low temperature is set to be -51ºC (-60ºF). Three high to low cycles are performed.

Shock testing options

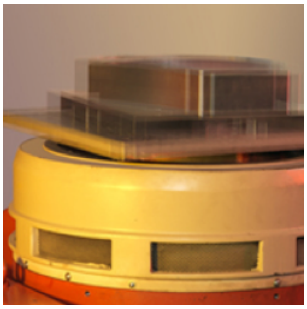
- Half Sine
- Sawtooth
- Squarewave
- Pyrotechnic
- SRS
- Analog capture

Vibration test

The vibration test is performed in accordance to the MIL-STD-810G, Method 514.6 Procedure I Category 4 and 24. This test is designed to simulate a 1,000 mile shipping distance on a U.S. highway. Terrain, road and surface, discontinuities, vehicle speed, loading, structural characteristics, and suspension system are all reflected in this simulation. This test also evaluates ZBook operation after it has been subject to higher levels of vibration while in storage.

Vibration testing options

- Random, sinusoidal, mixed mode
- Transportation and packaging
- Combined with temperature and/or humidity



Sand/Dust test

The dust test is performed in accordance to the MIL-STD-810G, Method 510.5 Procedure I. These test parameters are set so that the ZBook is dusted with Arizona Road Dust for six hours while being operated.

Humidity test

The humidity test is performed in accordance to the MIL-STD-810G, Method 507.5 Procedure II. During the humidity test, the products endure ten 24-hour cycles with temperature changes between 30ºC (86ºF) and 60ºC (140ºF). The entire time this test is performed, the humidity level stays constant at 95% relative humidity.

Altitude test

The altitude test is performed in accordance to the MIL-STD-810G, Method 500.5 Procedure I and II. This test is designed to simulate a 15,000 foot altitude level; the highest altitude for cargo pressures in military aircrafts.

High/low temperature test

The high temperature test is performed in accordance to the MIL-STD-810G, Method 501.5 Procedure I and II. The low temperature test is performed in accordance to the MIL-STD-810G, Method 502.5 Procedure I and II.

The high temperature test evaluates the ZBook's performance while it is being exposed to high temperature conditions: 60ºC (140ºF) and 71ºC (160ºF).

The low temperature test evaluates the ZBook's performance while it is being exposed to high temperature conditions: -29ºC (-20ºF) and -51ºC (-60ºF).

OS/PXE Boot

HP ZBook 17 G2 Mobile Workstation users may encounter difficulties loading a Windows® 7 image onto a system that is pre-loaded with Windows 8[10]. This problem stems from a system conflict in the preboot execution environment (PXE, often pronounced 'pixie'): Windows 7 does not support Secure Boot, a UEFI BIOS feature enabled in Windows 8 systems. When Windows 7 is loaded on a Windows 8 system, the Secure Boot firmware blocks the launch of the OS.

Secure Boot overview

Secure Boot is a feature that ensures only authenticated code can start on a platform. The firmware is designed to mitigate root kit attacks by preventing launch of an untrusted OS through verification of the OS loader publisher based on policy.

Figure 5. UEFI Secure Boot flow

- Firmware enforces policy and only starts signed OS loaders it trusts.
- OS loader enforces signature verification of later OS components.
- The UEFI BIOS checks the signature of the OS loader before loading. If the signature is not valid, the UEFI BIOS will stop the platform boot.

BIOS and UEFI background

As computer technology has advanced, the BIOS has expanded to handle new components, larger and more complex chipsets, add-in cards, and other enhancements. This expansion has made the BIOS increasingly intricate. Development of the Unified Extensible Firmware Interface (UEFI) is the computer industry's solution to BIOS limitations. UEFI is a set of modular interfaces that replaces the set of traditional BIOS interfaces between the OS and platform firmware.

UEFI is derived from high-level C language and is driver-based, scalable, and easy to debug and upgrade. UEFI uses a modular, platform-independent architecture that can perform boot and other BIOS functions. For more information about UEFI, go to hp.com/go/techcenter.

Issue

A Windows® 7 image will not boot on a Windows 8[10] system when Secure Boot is enabled because Windows 7 does not support Secure Boot and is thus seen as an untrusted OS. If using PXE boot or another operating system loader to load a Windows 7 image on a Windows 7 machine or a Windows 8 downgrade to a Windows 7 pre-installed system, there should not be any issues. However, if trying to load a Windows 7 based image on a Windows 8 pre-installed system,the secure boot protection will be activated. Customers have found that when trying to image the HP ZBook 17 G2 system via PXE boot, the imaging process causes the system to fail. To avoid this issue, users will need to perform the steps below before attempting to boot the system.

Platforms affected
This issue has been seen on all the first and second generation HP ZBook Mobile Workstations, as well as desktop workstations and commercial PCs due to the supported transition from Windows 7 to Windows 8.1.[8]

Steps to a solution for Mobile Workstations

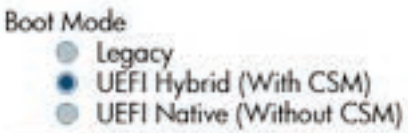
Customers who have ordered a mobile workstation that is pre-loaded with Windows 8 may be able to load a Windows 7 image by turning off the Secure Boot option in the BIOS. To do that:

Step 1: Power on the unit and press either the Escape key or F10 to enter the BIOS Menu

Step 2: Select the Advanced tab > Boot Options

Step 3: Scroll down and uncheck Secure Boot and select Accept when asked to disable Secure Boot

Step 4: Change Boot Mode to Legacy or UEFI Hybrid (With CSM)



Step 5: Press F10 again to save the change and exit BIOS Menu. Then, reboot the system.

After a reboot, the system will now be allowed to PXE boot to an OS deployment server.

Recommendations

- For large-scale deployment, the most simple solution is to order systems with Windows 7 (including Windows 7 with Windows 8/8.1 license)—these will come with the BIOS set properly for Windows 7.
- Custom Integration Services (CIS) can load custom images for deployment in over 100 countries so each unit is configured the same and ready to run when it arrives at the customer location.

Preferred Offerings

As a workstation customer, we know that you often need your product delivered quickly. That is why we have created the Preferred Offering program for the new HP ZBook Mobile Workstations. The Preferred Offering program aims to ensure high availability and short turn-around times on your orders.

The Preferred Offering program uses configurations that represent the mainstream components that make up a large percentage of shipments. Put simply, our most popular systems will be stocked with a buffer to assure the delivery of those systems to you in a timely manner. In fact, 90% of orders using the Preferred Offering program selections are filled in 6 days. And with roughly 40 percent of our mobile workstation parts on the Preferred Offering list, you have several options to choose from to build a system that fits your needs.

Table 11. The following AVs are part of the Preferred Offering program selection:

Base Unit	
G6Z40AV	HP IDS DSC 2D Z17 Base NB PC
G6Z41AV	HP IDS DSC 4D Z17 Base NB PC
G6Z42AV	HP RCTO DSC 2D Z17 Base NB PC
G6Z43AV	HP RCTO DSC 4D Z17 Base NB PC
Graphics	
G6Z45AV	NVIDIA® Quadro® K1100M Graphics
J2A80AV	NVIDIA® Quadro® K2200M Graphics
G6Z46AV	NVIDIA® Quadro® K3100M Graphics
G6Z49AV	AMD FirePro™ M6100 Graphics
Processor[5]	
G6Z60AV	Intel® Core™ i5-4340M dual-core[5]
G6Z62AV	Intel® Core™ i7-4710MQ quad-core[5]
G6Z63AV	Intel® Core™ i7-4810MQ quad-core[5]
G6Z64AV	Intel® Core™ i7-4910MQ quad-core[5]
Camera-Integrated	
G8R85AV	WEBCAM Integrated 720p HD
Display	
G6Z86AV	17.3-inch diagonal LED HD+ SVA Anti-Glare enabled for Webcam (1600 x 900)
G6Z85AV	17.3-inch diagonal LED FHD WVA Anti-Glare enabled for Webcam (1920 x 1080)
Memory[12]	
G6Z97AV	4 GB 1600 MHz DDR3L 1DM
G6Z98AV	8 GB 1600 MHz DDR3L 1DM
G6Z99AV	8 GB 1600 MHz DDR3L 2DM
G6Z94AV	16 GB 1600 MHz DDR3L 2DM
G6Z95AV	16 GB 1600 MHz DDR3L 4DM
G6Z96AV	32 GB 1600 MHz DDR3L 4DM

HP Z Turbo Drive	
G7A07AV	256 GB HP Z Turbo Drive (PCIe Solid State Drive)
Internal storage[13]	
G6Z68AV	1 TB 7200 RPM
G6Z75AV	500 GB 7200 RPM
G6Z79AV	750 GB 7200 RPM
G7A01AV	128 GB SATA-3 Solid State Drive
G7A08AV	256 GB SATA-3 Solid State Drive
G7A13AV	256 GB SATA-3 Self Encrypted OPAL2 Solid State Drive
G7A16AV	512 GB SATA-3 Solid State Drive
Secondary internal storage	
G6Z69AV	1 TB 7200 RPM
G6Z76AV	500 GB 7200 RPM
G6Z80AV	750 GB 7200 RPM
G7A02AV	128 GB SATA-3 2nd Drive Solid State Drive
G7A09AV	256 GB SATA-3 2nd Drive Solid State Drive
G7A14AV	256 GB SATA-3 Self Encrypted OPAL2 2nd Solid State Drive
G7A17AV	512 GB SATA-3 2nd Drive Solid State Drive
Upgrade Bay	
G6Z70AV	1 TB 7200 RPM
G6Z93AV	DVD+/-RW SuperMulti DL
G7A15AV	256 GB SATA-3 Self Encrypted OPAL2 Solid State Drive
G7A18AV	512 GB SATA-3 Upgrade Bay Solid State Drive
Battery	
G6Z52AV	8 Cell 75 WHr Long Life
G6Z53AV	8 Cell 83 WHr
AC Adapter	
G6Z50AV	200 Watt Smart PFC Slim AC Adapter
G6Z51AV	230 Watt Smart PFC Slim AC Adapter
Fingerprint reader	
J3X91AV	Fingerprint Reader
Wireless LAN	
G9T52AV	Intel® 7260 ac 2x2 +Bluetooth® 4.0 LE WW
G9T54AV	Intel® 7260AN abgn 2x2 +Bluetooth® 4.0 LE WW

Resources, contacts, or additional links

HP ZBook 17 G2 Mobile Workstation
hp.com/go/ZBook17

More information on Secure Boot
HP Consumer Support: Secure Boot (Windows 8)

More information on Custom Integration Services
HP Personal Systems: Configuration Services

Learn more at
hp.com/go/whitepapers

1. Optional feature.
2. Thunderbolt™ 2 is available via an optional add-in card on Z1, Z230 SFF, Z230 Tower, Z440, Z640 and Z840 Workstations. It is standard on ZBook 15 and 17 Mobile Workstations. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see thunderbolttechnology.net/products.
3. HP Performance Advisor requires Windows and an internet connection.
4. EPEAT® registered where applicable. EPEAT registration varies by country. See epeat.net for registration status by country.
5. Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel®'s numbering is not a measurement of higher performance.
6. 4K content required to view 4K resolution.
7. DisplayPort connector support a DisplayPort display, a HDMI display with an DP-to-HDMI dongle, a VGA display with a DP-to-VGA dongle, or a DVI display with a DP-to-DVI dongle.
8. With AMD Graphics, up to any 5 combination of these displays may be active when at least two external DisplayPort displays are used.
9. Multiple displays may be connected to DP 1.2 Hub. DP 1.2 Hub is connected to a DisplayPort connector on the HP ZBook or Docking Station.
10. Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows functionality. See microsoft.com.
11. Not available when using WWAN.
12. Maximum memory capacities assume Windows 64-bit operating systems or Linux. With Windows 32-bit operating systems, memory above 3 GB may not all be available due to system resource requirements.
13. 1 GB = 1 billion bytes, TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB of system disk is reserved for system recovery software (for Windows 8).

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